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09/684,763	10/06/2000	Leon K. Woo	TEN-001(7942/7)	1638

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EXAMINER	
NG, CHRISTINE Y	
ART UNIT	**PAPER NUMBER**
2663	6

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/684,763	WOO ET AL.	
	Examiner	Art Unit	
	Christine Ng	2663	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 October 2000*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-92* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *17-48 and 65-92* is/are allowed.

6)☒ Claim(s) *1,4-6,9-15,49,50,52-58 and 60-63* is/are rejected.

7)☒ Claim(s) *2,3,7,16,51,59 and 64* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *06 October 2000* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1, 5, 6, 9, 10, 15, 49, 50, 53, 54, 60, 62, and 63 are rejected under 35 U.S.C. 102(e) as being unpatentable over U.S. Patent No. 6,229,812 to Parruck et al.

Referring to claim 1, Parruck et al disclose in Figure 4 a packet-buffering system in a communication device for transferring packets received over a communication network from an input port (Element 306) to an output port (Element 320) of the communication device.

The system comprises a first-level memory (Element 402) segmented into a plurality of first-level queues (Elements 410(a)-410(h)) each having a first-buffer depth, the plurality of first-level queues (Element 410(a)-410(h)) receiving the packets from the input port (Element 306) of the communication device. "Incoming SAP structure 402 is further coupled to link 310 through input port 307" and link 310 "couples with a plurality of traffic generators TG 306(a) – TG 306(h)" (Column 8, lines 59-63).

The system also comprises a second-level memory (Element 301) in communication with the first-level memory (Element 402) and the output port (Element

320), the second-level memory (Element 301) being segmented into a plurality of second-level queues (Elements 302(a)-302(x)) each having a second-buffer depth and being associated with the output port (Element 320) of the communication device, the plurality of second-level queues (Element 302(a)-302(x)) receiving packet data from at least one of the plurality of first-level queues (Element 410(a)-410(h)) and transferring the packet data to the output port (Element 320). "Within SAP structure 402, there are a plurality of buffer structures 410(a)-410(q), each of which corresponds to a respective one of buffer structures 302(a)-302(q) of switch element 301" (Column 8, lines 64-67). Also, the input arbitrating portion (Element 412) represents "circuitry for arbitrating access from buffer structures 410(a)-410(q) to link 408" (Column 9, lines 3-5).

The system includes that the sum of the second-buffer depths exceeds a sum of the first-buffer depths. The second buffer (Element 301) comprises queues from 302(a) to 302(x) whereas the first buffer (Element 402) comprises queues from 410(a) to 410(h). Refer to Figure 4.

Referring to claims 5 and 62, Parruck et al disclose in Figure 4 that the first (Element 402) and second-level (Element 301) memories are implemented in a partially connected mesh architecture having a plurality of input ports (Element 306) and a plurality of output ports (Element 320), at least one of the input ports (Element 306) being switchably connected to at least one of the output ports (Element 320). "Any traffic generator (306) may be coupled with any traffic acceptor (Element 320) via switch element 301" (Column 6, lines 54-55).

Referring to claims 6 and 50, Parruck et al disclose in Figure 4 that the received packets have priority levels associated therewith, each of the plurality of second-level queues being assigned a priority level and receiving packets having a priority level consistent therewith. The input arbitrating portion (Element 412) is implemented via schedulers and selectors to transfer data to the second-level queues (Elements 302(a)-302(x)) so as to "ensure fair and appropriate selection of ATM cells in view of the respective priorities of the input data" (Column 9, lines 12-16). Parruck et al also disclose in Figure 7 that each queue (Elements 702-708) from the traffic generators is assigned a priority level before transmission to the scheduler (Element 710). Refer to Column 11, lines 3-16.

Referring to claims 9 and 53, Charny et al disclose in Figures 3 and 4 a scheduler (Figure 3, Elements 350-364) in communication with the plurality of second-level queues (Figure 4, Elements 302(a)-302(x)), the scheduler (Figure 3, Elements 350-364) independently scheduling packets received by the plurality of second-level queues (Figure 4, Elements 302(a)-302(x)) on a pure priority basis. The input arbitrating portion (Element 412) is implemented the same way of the output arbitrating portion (Figure 3, Element 314), which consists of schedulers (Figure 3, Elements 350-364). Furthermore, the schedulers of the input arbitrating portion (Figure 4, Element 412) ensures "fair and appropriate selection of ATM cells in view of respective priorities of the input data" (Column 9, lines 16-17).

Referring to claims 10 and 54, Parruck et al disclose in Figure 4 a scheduler (Element 412) in communication with the plurality of second-level queues (Elements

302(a)-302(x)), the scheduler (Element 412) independently scheduling packets received by the plurality of second-level queues (Elements 302(a)-302(x)) using a weighted fair queuing technique. Parruck et al disclose in Figure 7 that each of the queues (Elements 702-708) is assigned a weight (702=1, 704=2, 706=2 and 708=4). "As scheduler 710 selects from each queue in turn, one cell will be outputted from queue 702, two cells each will be outputted from queues 704 and queue 706, and four cells will be outputted from queue 708" (Column 11, lines 45-50).

Refer to claim 15 and 63, Parruck et al disclose that the first-level memory (Element 402) is composed of a first memory type (buffer structures) and the second-level memory (Element 301) is composed of a second memory type (buffer structures), the second-memory type having performance characteristics substantially similar to the first memory type. Buffer structures (Elements 410(a)-410(h)) of the first memory (Element 402) is similar to buffer structures (Elements 302(a)-302(x)) of the first memory (Element 301). "A buffer structure may be implemented as a dedicated queue in hardware or as memory construct in digital memory" (Column 6, lines 24-26).

Referring to claim 49, Parruck et al disclose a method of buffering packets in a data in a communication device. The method comprises the step of receiving the packets at an input port (Element 306) of the communication device; providing first-level queues (Elements 410(a)-410(h)) associated with the input port (Element 306) and having a first-buffer depth, the first level queues (Elements 410(a)-410(h)) receiving the packets from the input port (Element 306); selecting an output port (Element 320) of the communication device as a destination for the received packets; providing second-level

queues (Elements 302(a)-302(x)) associated with the selected output port (Element 320) and corresponding to the first-level queues (Elements 410(a)-410(h)), the second-level queues (Elements 320(a)-320(x)) having a second-buffer depth exceed the first-buffer depth of the first-level queues (Elements 410(a)-410(h)); transferring the received packets from the first-level queues (Elements 410(a)-410(h)) to the corresponding second-level queues (Elements 320(a)-320(x)); and transmitting the transferred packet in the second-level queues (Elements 320(a)-320(x)) to the selected output port (Element 320). Refer to the rejection of claim 1.

Referring to claim 60, Parruck et al disclose in Figure 8A aggregating the received packets with substantially similar forward attributes into queue flows and then routing the queue flows into the first-level queues (Elements 410(a)-410(h)). In Figure 8A, connections B and C both have a weight of 2 so function Y will group the output cells from queues 704 and 706 together and output them to scheduler 810. Function X will output cells from queue 702 since only one connection has a weight of 1 and function Z will ouput cells from queue 708 since only one connection has a weight of 4. Refer to Column 12, lines 24-31.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 4 and 61 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,229,812 to Parruck et al in view of U.S. Publication No. 2002/0054568 to Hoogenboom et al. Parruck et al disclose in Figure 4 a first (Element 402) and second-level (Element 301) having a plurality of input ports (Element 306) and a plurality of output ports (Element 320). Parruck et al do not disclose that the input and output ports are connected in a fully connected mesh architecture, each input port being continuously connected to a corresponding output port. Hoogenboom et al disclose in Figure 2 a switch according to the full mesh architecture, in which each input port (Element 210) is associated with only one corresponding output port (Element 230) through the switch fabric (Element 200). Refer to Paragraph 0024. The full mesh architecture allows data packets to travel from input port to output port with little delay, whereas in partial mesh architectures, delay can occur when packets from many different input ports are destined for the same output port. Therefore, it would have obvious to one of ordinary skill in the art at the time the invention was made to include that the input and output ports are connected in a fully connected mesh architecture; the motivation being that a full mesh architecture allows packets to travel from an input port to a designated output port with little delay and no competition with packets from other input ports.

5. Claims 8, 13, 14, 52, 57 and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,229,812 to Parruck et al in view of U.S. Patent No. 5,831,980 to Varma et al.

Referring to claims 8 and 52, Parruck et al disclose in Figure 4 a scheduler (Element 412) in communication with the plurality of second-level queues (Elements 302(a)-302(x)). Parruck et al do not disclose that the scheduler donates bandwidth from one of the second-level queues with a first priority level to another queue with a second priority level, the first priority level being lower than the second priority level. Varma et al disclose that in ATM systems, each traffic class (CBR, VBR, ABR and UBR) is assigned an upper and lower bound on bandwidth it can use. Each traffic class is also assigned a priority with CBR given the highest priority, then VBR, then ABR, and UBR with the lowest priority. The bandwidth given to CBR and VBR sources cannot be donated while the connections are active. However, bandwidth given to ABR and UBR sources can decrease during a connection, such as when new CBR and VBR connections come up. Refer to Column 2, lines 47-55. Therefore, it would have obvious to one of ordinary skill in the art at the time the invention was made to include that the scheduler donates bandwidth from one of the second-level queues with a first priority level to another queue with a second priority level, the first priority level being lower than the second priority level, the motivation being that lower priority traffic sources may need to donate their bandwidth to higher priority sources.

Referring to claims 13 and 57, Parruck et al disclose in Figure 4 a scheduler (Element 412) in communication with the plurality of second-level queues (Elements 302(a)-302(x)), the scheduler (Element 412) independently scheduling packets received by the plurality of second-level queues (Elements 302(a)-302(x)). Parruck et al does not disclose that the scheduler (Element 412) uses a bandwidth donation technique.

Varma et al disclose that in ATM systems, each traffic class (CBR, VBR, ABR and UBR) is assigned an upper and lower bound on bandwidth it can use. Each traffic class is also assigned a priority with CBR given the highest priority, then VBR, then ABR, and UBR with the lowest priority. The bandwidth given to CBR and VBR sources cannot be donated while the connections are active. However, bandwidth given to ABR and UBR sources can decrease during a connection, such as when new CBR and VBR connections come up. Refer to Column 2, lines 47-55. Therefore, it would have obvious to one of ordinary skill in the art at the time the invention was made to include that the scheduler uses a bandwidth donation technique, the motivation being that lower priority traffic sources may need to donate their bandwidth to higher priority sources.

Referring to claims 14 and 58, Parruck et al disclose in Figure 4 a scheduler (Element 412) in communication with the plurality of second-level queues (Elements 302(a)-302(x)), the scheduler (Element 412) independently scheduling packets received by the plurality of second-level queues (Elements 302(a)-302(x)). Parruck et al does not disclose that the scheduler (Element 412) uses a combination selected from pure priority, weighted fair queuing, random early detection technique, weighted random early detection technique, and bandwidth donation. Varma et al disclose in Figure 2 a method that supports both weighted fair queuing (WFQ) and pure priority. Output queues are divided into four groups (A, B, C, D) with all queues in group A being served according to the WFQ method and queues in groups B, C and D served according to a round-robin method. Within group A, queues are served according to a priority order, with CBR traffic which is of highest priority being served first, then VBR traffic, then ABR

traffic, and finally UBR traffic which is of lowest priority being served last. Refer to Column 6, lines 55-57 and Column 7, lines 5-44. Therefore, it would have obvious to one of ordinary skill in the art at the time the invention was made to include that the scheduler uses a combination of WFQ and pure priority; the motivation being that WFQ allows re-distribution of unused bandwidth among active flows and priority based scheduling grants transmission permits to higher priority traffic before lower priority traffic. Refer to Column 2, lines 41-55 and Column 7, lines 45-51.

6. Claims 11 and 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,229,812 to Parruck et al in view of U.S. Patent No. 6,333,917 to Lyon et al. Parruck et al disclose in Figure 4 a scheduler (Element 412) in communication with the plurality of second-level queues (Elements 302(a)-302(x)), the scheduler (Element 412) independently scheduling packets received by the plurality of second-level queues (Elements 302(a)-302(x)). Parruck et al does not disclose that the scheduler (Element 412) uses a random early detection technique. Lyon et al disclose that random early detection (RED) avoids and controls congestion by periodically marking or discarding packets as the queue grows. In response to each packet marked or discarded, the source will slow down transmission which will reduce the totally quantity of traffic transmitted to the switch. Refer to Column 1, lines 40-46. RED is advantageous in that it "causes packet loss in a more distributed fashion than alternative strategies, and does not require specialized hardware – it functions with existing TCP protocols and hardware" (Column 1, lines 37-40). Therefore, it would have obvious to one of ordinary skill in the art at the time the invention was made to include

that the scheduler uses RED technique, the motivation being that RED periodically marks or discards packets as the queue grows so that the source will reduce its transmission rate; thereby controlling packet loss in a more distributed fashion than other congestion control strategies.

7. Claims 12 and 56 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,229,812 to Parruck et al in view of U.S. Patent No. 6,643,260 to Kloth et al. Parruck et al disclose in Figure 4 a scheduler (Element 412) in communication with the plurality of second-level queues (Elements 302(a)-302(x)), the scheduler (Element 412) independently scheduling packets received by the plurality of second-level queues (Elements 302(a)-302(x)). Parruck et al does not disclose that the scheduler (Element 412) uses a weighted random early detection technique. Kloth et al disclose that weighted random early detection (WRED) assigns a particular flow a low threshold and a high threshold. The low threshold specifies the depth of the queue below which packets will not be dropped and the high threshold specifies the depth of the queue above with packets will be dropped. Refer to Column 7, lines 22-30. Systems can select a low value for the low threshold for low priority queues and a high value for the low threshold for high priority queues. By doing this, WRED allows "certain high priority traffic to get through at the expense of other traffic in a device having multiple output queues" (Column 8, lines 7-9). Refer to Column 7, line 51 to Column 8, line 5. Therefore, it would have obvious to one of ordinary skill in the art at the time the invention was made to include that the scheduler uses a weighted random early detection technique, the motivation being that WRED assigns a low threshold to traffic

queues which specifies the minimum depth at which the queue can start dropping packets; thereby allowing high priority traffic to get through the network at the expense of low priority traffic.

Allowable Subject Matter

8. Claims 17-48 and 65-92 are allowed.

9. Claim 2, 3, 7, 16, 51, 59 and 64 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christine Ng whose telephone number is (703) 305-8395. The examiner can normally be reached on M-F; 8:00 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nguyen Chau can be reached on (703) 308-5340. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9314.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-8395.

C. Ng CN
January 15, 2004

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